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Fighting Crime and Insecurity in Nigeria: An Intelligent Approach

Mubarak Albarka Umar[1*], Abubakar Aliyu Machina[2], Muazzamu Ibrahim[3], Ja'afar A. Nasir[4], Abdullahi Saheed Salahudeen[5], Musa Mustapha[6], Isiaka Shuaibu[7]

[1]*Katsina State Institute of Technology and Management, Katsina, Nigeria.*
[2,4,5,6]*Changchun University of Science and Technology, Jilin, China.*
[3]*Binyaminu Usman Polytechnic, Hadejia, Jigawa, Nigeria.*
[7]*Federal University of Technology, Minna, Niger, Nigeria.*

e-mail: [2]machinamaaa@yahoo.com, [3]muazzamuibrahim@bupoly.edu.ng, [4]nasirjafar10@yahoo.com, [5]saseedorf28@gmail.com, [6]musamustapha@qq.com, [7]ishaqlad@gmail.com
**Corresponding author: mubarak.albarka@ksitm.edu.ng*

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Abstract:- Over the years, insecurity and crime have been a significant issue in Nigeria. While the country successfully dealt with the past insecurity challenges conventionally, the government has failed to contain the new insecurity and crime challenges, especially that of the well-known Boko Haram lingering for over a decade now. This is due to various reasons, mainly the use of the same outdated, futile strategy. Several researchers have proposed numerous ways of tackling such insecurity challenges, mostly via a conventional approach; however, very few researchers proposed a more technological approach towards combating the insecurity challenges. In this paper, we discussed some modern technologies and how they can be applied to fight the new insecurities and crimes in Nigeria. We proposed the use of a Central Database as a backbone model serving as a central point of reference for all law enforcement agencies. Various modern technologies such as Facial recognition surveillance, Automatic plate number recognition, GIS and Crime Mapping, and Voice recognition are proposed to be integrated and used to identify and predict criminal activities, thus, mitigating the nation's prolonged insecurity and terrorism vulnerabilities.

Keywords: Crime and Insecurity, Modern Technology, National Database, Facial Recognition, GIS and Crime Mapping.

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1. Introduction

In a country with a high population of more than 195 Million, a vast landscape that shares uncontrolled borders with neighboring countries, various ethnic and religious groups, the risk of insecurity and other major and minor crimes is undoubtedly expected to be very high. The above factors certainly make Nigeria a fragile nation, with insecurity as one of the government's incessantly challenging tasks and a nagging issue for its citizens. Given the current perturbing time Nigeria is in, there is an ever-increasing need for not just the government or its bodies but also academicians and researchers to join hand in adding to the existing efforts being made to bring an end to the lingering insecurity and crime activities. Furthermore, as the classical approach of tackling crimes failed to bring a practical solution, the need to explore and adopt a modern method of utilizing an advanced technological approach might be the right tool in fighting and managing insecurity challenges as

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highlighted by Ewetan & Urchie (2014). While various governmental bodies and researchers are already exploring modern methods of intelligence gathering, sharing, and logistics in managing insecurity challenges; however, most of the available literature on insecurity related challenges focuses on the conventional approach and thus, this paper aims to provide an insight into how the modern methods as well as the advanced technological approach can be utilized in tackling crimes and mitigating insecurities.

As today's crimes and insurgent activities involve the use of technology, there is a need to adjust the approaches taken by law enforcement agencies in managing these activities. Hence, our proposal requires setting a model that will serve as a central point of reference for all law enforcement agencies, and with the integration of the right technological devices such as GIS and crime mapping, voice, facial, and plate number recognition systems, among others, to a security system; crimes can be predicted and prevented, thus, mitigating a giving nation's vulnerability (Chen & Wang, 2005).

The main contribution of this work include but no limited to highlighting the need for utilization of modern technology in combating insecurity as were successfully done by many developed nations. In Nigerian context, very few work of similar proposal was performed, thus our work can form the basis for many similar work to follow. And finally, the successful application of the proposed ideas will certainly contribute towards mitigating the nation's prolonged insecurity and terrorism vulnerabilities.

The rest of this paper is organized as follows: section II provides some background studies of insecurity challenges in Nigeria. In section III, we introduce the crime and intelligent gathering, analysis, and techniques with the proposed use of the national synchronized database model as the backbone of this work. We also separately discussed some selected modern technology such as SIM security and ownership, Facial Recognition and Surveillance Camera, Automatic License Plate Number Recognition, Voice Recognition, Social Media Policing, Application of GIS and Crime Mapping, and how they can be employed in the Nigerian framework. In section IV, we highlighted some limitations and challenges of our proposed work, and finally, section V concludes our study.

2. Background Studies

Historically Nigeria has witnessed various insurgency and or insecurity challenges. Starting from the civil war known as the Biafra movement, Niger Delta Crisis, Maitastine uprising in the 80s, Yalwan Shandam Ethnic/religious crisis, Jos, Zangon Kataf, Kaduna, Tafawa Balewa, Bauchi, Shagamu uprising, the Shi'a movement crisis, Zaria, Kaduna, Niger Delta Militants, Farmers/Herdsmen clashes in the north-central region and the Boko Haram (BKH) insurgency that started in late 2008 which continue linger for over a decade now. The BKH crisis has claimed more lives, properties, and displaced many people from their homes and communities, making it the most severe uprising that impacts the most drastic and devastating effect in Nigerian's history. At the peak of the BKH uprising, the country witnessed suicide bombings of vital critical infrastructures like mosques, churches, universities, markets, schools, government offices, security agencies, kidnapping of school pupils, among other horrendous incidents.

On the other side, other acts of crime that threaten peace in society, as insecurity may be classified into various levels depending on the level of danger it poses to society. These include drug or narcotic abuse, kidnapping, establishment of baby factories, cultism, robbery, smuggling of illegal arms, snatching, scammers/fraudsters also known as 'Yahoo boys', hit-and-run, rape, and other domestic violence.

A detailed discussion of the aforementioned tackled insurgencies and crimes and how they are managed can be found in the work of (Oludare et al., 2015; Adegbami and Uche, 2016; Ajayi and Longe, 2015). It can be seen that somewhat more traditional approaches were used in tackling each of these insecurity challenges; this is because the challenges were of conventional nature. That is why the same traditional approach currently being taken in addressing the contemporary insurgency challenges is insufficient and futile. Similarly, with the traditional means of investigating crimes, it will be difficult for relevant authorities to conclude a case or predict an occurrence intelligently. Hence, technology and time are essential in tackling insecurities or crime of any kind (Terkimbi, 2018).

3. Crime Intelligence Gathering, Analysis and Techniques

In recent years, criminals and insurgents are exploring the nation's security vulnerabilities devising new ways of posing harm to individuals, society, and the country; insurgency and criminal activities have indeed engulfed Nigeria at all axis, as stated by Adegbami and Uche (2016). The current security challenges cannot be solved through a force-to-force approach alone; other methods have to be derived. Therefore, firstly, the need to study and analyze various crime patterns cannot be overstated (Oguntunde et al., 2018); and for a successful outcome, a proactive strategy,

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tactics, and collaboration as well as harnessing and outsourcing exceptional technological devices are essential (Fatih and Bekir, 2015) as the use intelligent approach coupled with other technologies is more effective (Nayak & Dutta, 2017), this is because machines are consistent, reliable, efficient, robust and fast. Furthermore, computerized systems can help in solving crime related issues through crime data analysis (Chauhan and Sehgal, 2017), network analysis, crime mapping, biometrics, DNA research, fingerprints, facial recognition, speech recognition, social media policing, and other technologies that are in existence (Fatih and Bekir, 2015).

In this technological world, information is the key. Thus, for a practical and successful application of our proposed technological methods, there is a need for a primary source of information. With the synchronization of the national database as depicted in Figure 1, the national database will serve as the focal point from which all the utilized technological devices can refer for verifying and identifying criminals; thus, the collected citizens' data can be used and shared for matching sensitive information through comparing available data in individual security and law enforcement agencies, an interface can further be created to alert the security agencies of any identified criminal.

A. Synchronization of National Database

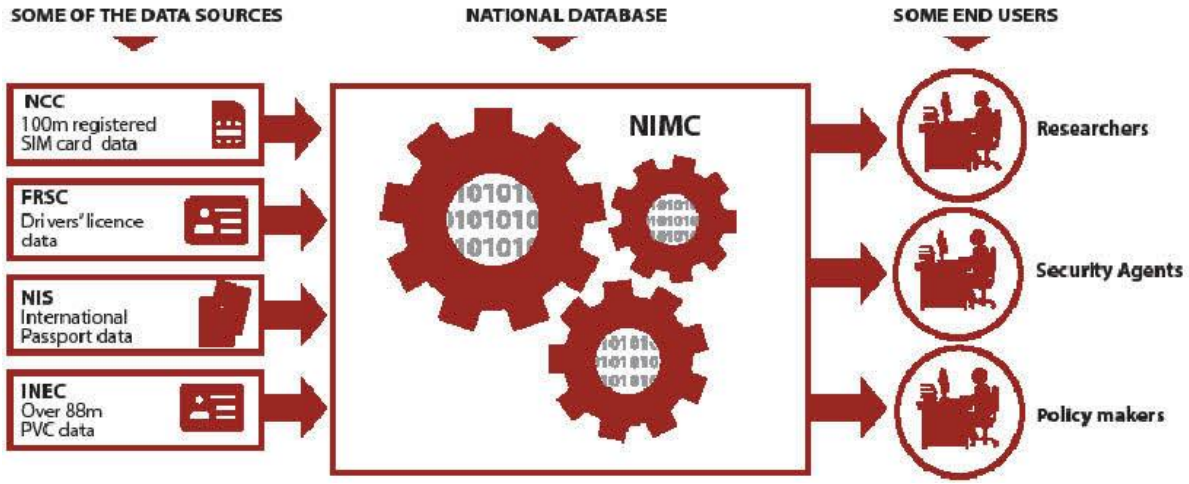

Figure 1: Proposed Central Database Framework

B. SIM Card Security and Ownership

Subscriber Identity Module (SIM) is a programmed microchip used to identify a subscriber on a mobile network. It also enables real-time communication and emergency alertness (Lane et al., 2010). The rise of SIM registration is one of the significant modalities of Africa's developing mobile-central surveillance society (Donovan et al., 2014). SIM registration involves capturing subscriber data and other information stored in the database of the service providers as shown in Figure 2. Its emergence has relieved network providers of the difficulty of tracking SIM card ownership (Tiamiyu and Mejabi, 2012). Though most countries have introduced mandatory SIM registration to address national security concerns and criminal behavior (GSMA, 2013), African countries face mobile-phone-related criminality (Donovan et al., 2014). In a follow-up study, Michael et al. (2014) deduced that criminals use registered SIM to commit crimes, thereby implicating the rightful owner. According to media reports on African countries, mobile handsets are used to demands ransom for kidnapped victims (Hemeson C., 2012) and the duping crime business, popularly known as 419.

Figure 2: SIM Card Security and Ownership

There is a growing body of literature that recognizes the significance of SIM cards in ensuring security. According to Jacques (2018), SIM cards help track subscriber location & communication through generated offline mobile phone metadata (call detail record, visitor location register & passive monitoring system). Shaun et al. (2008) suggest blocking and blacklisting International Mobile Subscriber Identity (IMSI) & IMEI to determine illegal SIM & phone

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usage. While Donald and Favour (2016) highlight the Public Key Cryptographic algorithm (encryption /decryption) to enhance telecommunication privacy.

However, surveillance performed by law enforcement agencies is via bugging (Ahmed et al., 2017). In a desire to have a credible database of SIM card holders and security in Nigeria, NCC in 2011 was borne out of the necessity to work with GSM providers and have achieved limited success. Hence, the making of National Identity Management Commission (NIMC) database as a point of reference by the GSM providers in collaboration with other relevant authorities, thus an effective utilization of SIM card GSM technological means along with the national database can prove to be effective in addressing some of the current insecurity challenges.

C. Facial Recognition Surveillance Camera

Face recognition is one of the biometric technologies used for identification and authentication by matching unique features of individual faces; it uses an algorithm that detects and extracts features by comparing them against stored template images in the database (Shivam et al., 2018). Individuals with a history of crime can be red-flagged; the system keeps track and automatically detects flagged criminals' faces via CCTV footage and alerts concerned authorities. A sample Figure 3 of the facial recognition surveillance capturing live streaming footage can be analyzed using algorithms through comparing the images stored in the database (Palmer,2018); in case of images with high noise, Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), or a combination of both can be used to improve quality of the image (Shivam et al., 2018). Similarly, images taken in a controlled environment can be enhanced using edge detection techniques (Shivam et al., 2018; Chetna et al., 2014).

There are few published papers on tackling insecurity in Nigeria using the Artificial intelligence approach. (Oludare, 2015) highlighted the use of ICT tools in tackling the insecurity in Nigeria without addressing the problem correctly. However, one paper addressed the use of a face recognition system in detecting criminals in the Nigerian police force, ignoring other security agencies (Ambrose, 2015). This paper provides the intelligent approach of face recognition whereby concerned security agencies in Nigeria can use Artificial intelligent (AI) embedded cameras to search live moving objects with specific attributes to track and detect criminal activities (Vincent, 2018).

Therefore, it is good to outline a strategic and most significant way to address the ongoing issues, including installing CCTV surveillance cameras to cover all sensitive areas, provide adequate power supply, proper maintenance, and scheduled monitoring evaluation routing. Besides, the NIMC must ensure that the database's template images must be of high quality.

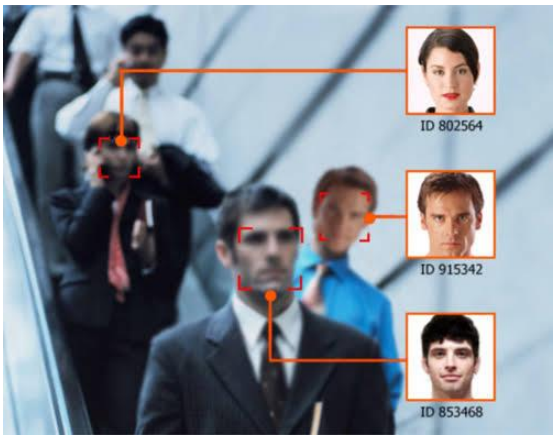

Figure 3: Facial Recognition Surveillance

Furthermore, the third entity, such as banks, should update and retain the images in their databases. Conclusively, if these issues are considered, and the system is highly implemented, it can serve as an excellent means to enhance security surveillance, fight crime, and improve living standards in Nigeria.

D. Plate Number Recognition

License Plate Number is used as a means of uniquely identifying vehicles and their respective owners. Most of the existing literature on Plate Number Recognition in the Nigerian context pays particular attention to the recognition patterns, techniques, and algorithms; Sobel filter, morphological operations and connected component analysis (Owomayo et al., 2015), watershed (morphological) segmentation techniques and template matching (Attah et al., 2016), Optical Character Recognition and back-propagation algorithm (Amusan et al., 2015), edge detection technique, vertical and horizontal analysis for character segmentation, median filter and Artificial Neural Network for recognition (Tayo and Gideon, 2013), while ignoring its possible contribution to national security; Automatic License Plate Number Recognition (ALPNR) is an advanced machine vision technology for identifying or recognizing vehicles plates number with minimal human intervention (Owomayo et al., 2015).

License Plate Number shown in Figure 4, if integrated with Automatic License Plate Number Recognition System (ALPNRS), can serve a great purpose in fighting crime and insecurity. It is a general tool that can help

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public policing by restricting criminal movement, improve security and safety (Rhead et al., 2012) through toll collection, borders, and custom security (Owomayo et al., 2015). Qadri and Asif (2009) highlight some of its security, crime, and speed limit control applications. Other minor traffic offenses or violations can be tracked and simultaneously alert offenders of their penalty via SMS (Shreyas et al., 2017) and prove criminal trials (North Yorkshire Police, 2018).

Figure 4: Plate Number Recognition

Access to precise, accurate, and timely information is essential, especially in dealing with crimes such as vehicle theft, kidnapping, and tracking of armed bandits. Proper use and implementation of ALPRS will make it easier for relevant authorities like NPF, FRSC, NCS, NIS to easily track targets or establish a link to an ongoing investigation via alerting authorities of target proximity location. Therefore, ALPRS systems can be customized and installed on key or critical infrastructures like Federal and States road, seaports, land borders, and police patrol cars. Thus, ALPNRS in standard is remarkably accurate (Rhead et al. 2012), fast and efficient. Subsequently, the system can serve as a medium to register new plate numbers, thereby remitting due tax to the government. Hence, mitigating the level of financial crimes.

However, factors such as uncontrolled environment, weather, un-tactical positioning of cameras, or crime footage obtain via non-dedicated ALPNR cameras are of concern; Salfraz et al. (2013) proposed a novel solution of localizing, tracking, and recognizing license plate obtained through real-time video streams from other surveillance sources. Therefore, it addressed the issue of low or blur video footage. The use of technology and the national database can effectively tackle many activities and crimes, especially road related crimes and hit-and-run.

E. Voice Recognition

Voice recognition is one of the biometric authentications that uniquely identify individuals based on their voice behavioral characteristics. Recently, Voice recognition technology is gaining popularity in the forensic field as it plays a valuable part in preventing and solving crimes and terrorism (European Commission, 2018), as most crimes are planned and executed using cell phone calls (McMillan et al., 2013) hence, providing traces of metadata. Metadata integrated with voice recognition technology can help prevent crimes and quickly identify the criminal's location.

Figure 5: Mobile Phone Voice Recognition

Speaker Identification Integrated Project (SIIP) – a successful European Commission Project that uses Voice Recognition technology over cell phone calls and any other speech source in fighting against crime and insecurity. Multiple speech analytic algorithms are employed to analyse any speech source and channel to perform a comparative search over a database hosted by Interpol, enabling authorities worldwide to search and upload voice references (Speaker Identification Integrated Project, 2017). The use of voice technology in fighting crimes and insecurity could be decisive (Li et al., 2014); however, the field lacks enough literature, especially in Nigerian context.

The use of mobile phone networks in detecting criminals is acquiring increasing importance in fighting crime and insecurity (Ferrara et al., 2014) and provide evidential value in criminal cases (McMillan et al., 2013) through providing traces in the form of metadata such as cell towers, GPS, and voice to the cell service providers (Newnam, 2013). There are numerous Voice Recognition commercial software solutions that can be integrated into Mobile Service Providers' networks without violating privacy policy. The software work as a backend by comparing calls with an already stored voice of target criminal in the Central Database and alert relevant Law Enforcement Agencies on finding a corresponding voice, providing caller's and receiver's details to the agencies.

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Voice ID is a Voice Recognition software that performs comparisons on live cell phone calls voice (as depicted in Figure 5 above) against recorded voices of target criminals with an acute throughput and language agnostic nature (Counter, 2016); hence, this technology quite suit Nigeria's language diversity, and with the help of the existing national database, it can be useful and precise in tackling insecurity challenges.

F. Social Media Policing

Social media is the use of the internet to access applications to communicate (Denef et al., 2012). Social media users have speedily outnumbered radio, print, and television media (Erik Qualman, 2009). Several surveys have evidenced the revolution of social media as the new arena for convergence (David, 2013; Spizman and Miller, 2013). Criminal activities have often been staged on social media (Denef et al., 2012). Social Media Policing is the surveillance and monitoring of social media platforms to proactively and intelligently combat crime (Scassa, 2017) as shown in Figure 6 below. Everyday crime activities such as hate speech, information theft, cyber-stalking, and scams can be put to check.

Figure 6: Social Media Policing

Law enforcement agencies are being handicapped against criminals due to the re-staging of the possible crime avenue on social media. Many countries are strategizing to police social media at the national and regional level (Denef et al., 2012; Sachdeva and Kumaraguru, 2014). Papachristos and Sierra-Arevalo (2018) highlighted the importance of using Social Media in policing the connected world. They further deduced that individual's relationships and communication on social media could inform and predict their behaviour. Spizman and Miller (2013) suggest that it can be used for evidence collection; location of criminals and their associates (Robert, 2013). Additionally, social media policing can be used for early warning, threat assessment of mobs, riots, and protests staging locations (Krause, 2011); mapping, prediction, and profiling of crimes (Scassa, 2017); and foster collaborative efforts with citizens in policing the society (Ezenkwu, 2013).

Nigeria has had its share of crimes and threats that have been planned, originated, perpetrated, executed, and sometimes broadcasted via social media (Global Terrorism Database, 2017). Such as the interfaith conflict in Kaduna and Plateau States, which was investigated to have resulted from rumours on social media (Raphael, 2015; WANEP NIGERIA, 2018)? Therefore, policing the Nigerian social media can help in Intelligent gathering, crime prevention, and improved investigation, and with the availability of the national database, identifying criminals can be made easier. However, fair usage and privacy of citizen data are guaranteed through accessing open-source data, open APIs, and other ethical data sources.

G. Application of GIS and Crime Mapping

Historically, the study of crime has traditionally focused on other disciplines such as sociology, criminology, and psychology. It was until the late 1970s that the 'place' and spatial dimension of crime began to be more fully explored, thus a geographical location of a crime is an important entity of crime analysis and strategy (Ratcliffe and Chainey, 2013). Criminal activities at any geographic area can be represented using remote sensing data (aerial photographs and satellite imageries) concepts of GIS and mappings to help in strategy formulation, tactical analysis, geographic profiling, and crime forecasting (Madhavi, 2013) as shown in Figure 7 below.

However, most of the previous literature written in Nigeria focused mainly on the theoretical aspects of GIS and crime mapping by highlighting its importance and adopting the system for crime and security purposes in some prominent areas (Balogun et al., 2014), as well as analytical aspects of GIS and crime mapping with less emphasis on its implementation.

Similarly, commercial GIS software solutions can be outsourced and integrated with the Nigerian satellite resources, notably Nigerian Communication Satellite (NIGCOMSAT), for further optimal utilization. Therefore, with the proper application and implementation of crime mapping brought by the technology today as highlighted earlier above, it can best be used to fight crime and insecurity in Nigeria (Yelwa, 2012).

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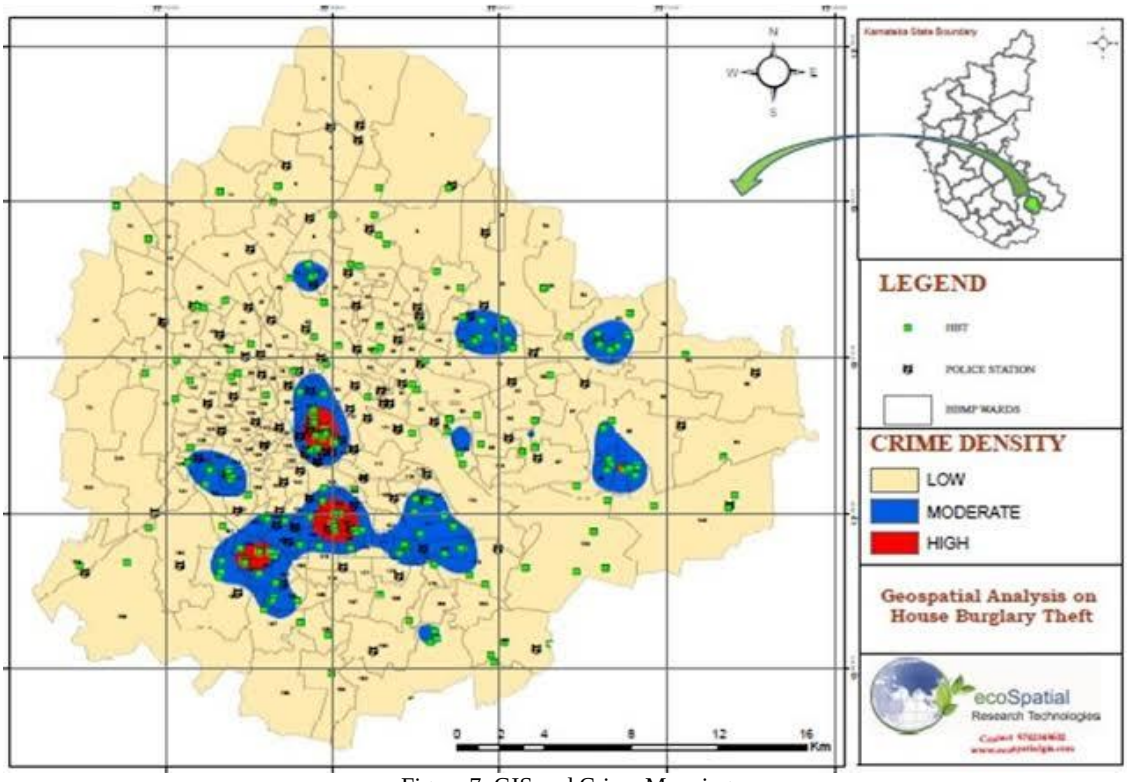

Figure 7: GIS and Crime Mapping

4. Limitations and Challenges

It will be an overstatement to say that our proposed approach of utilizing the central database, as the backbone, with the modern technological means in fight insecurity and crimes is perfect or does not have loopholes. The proposed technologies have proven to be effective when applied in, particularly, the developed countries; it will however be obtuse to think or say that they will bring about the same effects once they are deployed in Nigeria. The application of those technologies has to be weighed along with certain measures and other existing challenges in the Nigerian context. A careful study of the possible hindrance and challenges revealed some of the following limitation and challenges:

a) Dispersed data source and sharing as well as lack of co-ordination between Nigerian's law enforcement agencies
b) Use of an already registered SIM card by other citizens thus making it hard to trace perpetrators
c) Privacy concerns because of information sharing with third parties which can result in misuse of pupils' information and might lead to even more crimes.
d) Obtaining high-quality image, which is needed for effective facial recognition, by the NIMC as well the devices can be challenging in some environment
e) Inadequate power and internet supply because most of these technologies require both to work effectively.
f) Due to the vast landscape and vast population, the installation and proper management of some devices can be a challenging task.
g) Poverty and Security concerns. In a country with high poverty rate, ensuring the protection of the installed devices can be difficult.

It should include important findings discussed briefly. Wherever necessary, elaborate on the tables and figures without repeating their contents. Interpret the findings in view of the results obtained in this and in past studies on this topic. State the conclusions in a few sentences at the end of the paper. However, valid colored photographs can also be published.

5. Conclusion

Fighting of crimes and insecurity in Nigeria has been a challenging task, indeed it's a challenging task even for the most developed countries, and this will surely continue to be the same. However, as with the developed countries, the use of modern technological means can be an effective means of reducing and controlling some insecurity challenges and crimes. Thus, in this study we proposed the use of some modern technologies in fighting an ever-increasing crime and

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insecurity challenges being faced in Nigeria. While this is an undoubtedly a right step toward ending the lingering security challenges, it's however not a silver bullet solution, it has its own loopholes and we hope we or other researchers can look towards improving or building on this studies to share more effective and diverse ideas in bringing an end to the challenges thus achieving peace and ensuring the safety of our country.

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